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Cesarean Section Rate in Siriraj Hospital According to the Robson Classification

Sirichet Anekpornwattana, M.D.*,
Jittiyaporn Yangnoi, B.N.S*,
Nida Jareemit, M.D.*,
Dittakarn Boriboonhirunsarn, MD. M.P.H., Ph.D.*

** Department of Obstetrics and Gynecology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand*

ABSTRACT

Objectives: To determine the cesarean section (CS) rate in Siriraj Hospital according to Robson classification.

Materials and Methods: In this cross-sectional study, all pregnant women who delivered in Siriraj Hospital during January to August, 2017 were included. Data were retrieved from medical records, including baseline, obstetric, and delivery information. Pregnant women were categorized into ten-group according to Robson classification. Overall and group-specific CS rate and contribution of CS were reported.

Results: A total of 4,998 pregnant women were included. Mean maternal age was 29.9 years, 50.7% were nulliparous, and 17.9% had previous CS. Of all women, 2,442 were delivered by CS (48.86%). Majority of cases were in group 1 (nulliparous with a single cephalic term pregnancy in spontaneous labor, 31.21%), followed by group 3 (multiparous with a single cephalic term pregnancy in spontaneous labor, 25.21%) and group 5 (multiparous with a previous uterine scar with a single cephalic term pregnancy, 14.17%), respectively. Major contribution of CS were from group 5 (28.91%), group 1 (23.71%), and group 2 (17.65%). Group-specific CS rates in group 1, 2, and 4 (multiparous with a single cephalic term pregnancy without spontaneous labor) were 37.12%, 84.02%, 58.53%, respectively. Further analysis showed that 68.4% of nulliparous and 55% of multiparous women without spontaneous labor (subgroup 2b and 4b) had pre-labor CS and most indications could be unnecessary. CS rate in nulliparous and multiparous women with labor induction (group 2a and 4a) were 49.38% and 7.41%, respectively, and labor was induced before 40 weeks in majority of the women, possibly without appropriate indications.

Conclusion: Overall CS rate in Siriraj Hospital was 48.86%. Group 1 and 2 contributed to one-third of the procedures that appropriate interventions should be developed to reduce CS rate.

Keywords: Robson Classification, cesarean section, delivery, Induction of labor.

Correspondence to: *Dittakarn Boriboonhirunsarn, M.D., Department of Obstetrics and Gynecology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand, E-mail: dittakarn.bor @mahidol.ac.th*

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อัตราการผ่าคลอดในโรงพยาบาลศิริราช ตามแบบ Robson classification

สิริเชษฐ์ อเนกพรวัฒนา, จิตติยาพร ยางน้อย, นิดา จารีมิตร, ดิฐกานต์ บริบูรณ์หิรัญสาร

บทคัดย่อ

วัตถุประสงค์: *เพื่อศึกษาและเก็บข้อมูลอัตราการผ่าตัดคลอดในโรงพยาบาลศิริราชตามแบบรอบสัน (Robson classification)*

วัสดุและวิธีการ: *ทำการศึกษาแบบตัดขวาง ในสตรีตั้งครรภ์ทุกรายที่คลอดในโรงพยาบาลศิริราช ตั้งแต่เดือนมกราคมถึงสิงหาคม 2560 ทำการสืบค้นข้อมูลจากระบบเวชระเบียน ประกอบด้วย ข้อมูลพื้นฐาน, ข้อมูลทางสูติศาสตร์, และข้อมูลการคลอด สตรีตั้งครรภ์จะถูกจำแนกเป็น 10 กลุ่ม ตามแบบรอบสัน (Robson classification) และรายงานผลเป็นอัตราการผ่าตัดคลอดทั้งหมด และอัตราการผ่าตัดคลอดตามกลุ่ม*

ผลการศึกษา: *การศึกษานี้ทำในสตรีตั้งครรภ์ทั้งหมด 4,998 ราย อายุเฉลี่ยเท่ากับ 29.9 ปี ร้อยละ 50.7 ของสตรีตั้งครรภ์ทั้งหมดเป็นการตั้งครรภ์แรกร้อยละ 17.9 เคยได้รับการผ่าตัดคลอดมาก่อนในครรภ์ก่อน จากสตรีตั้งครรภ์ทั้งหมด มีการผ่าตัดคลอด 2,442 ราย คิดเป็นร้อยละ 48.86 สตรีตั้งครรภ์ส่วนใหญ่จัดอยู่ในกลุ่ม 1 (ครรภ์แรก เป็นครรภ์เดี่ยว ท่าศีรษะ ครบกำหนด และเจ็บครรภ์เอง, ร้อยละ 31.21) กลุ่ม 3 (ครรภ์หลัง เป็นครรภ์เดี่ยว ท่าศีรษะ ครบกำหนด และเจ็บครรภ์เอง, ร้อยละ 25.21) และกลุ่ม 5 (ครรภ์หลัง เคยผ่าคลอด เป็นครรภ์เดี่ยว ท่าศีรษะ และครบกำหนด, ร้อยละ 14.17) ตามลำดับ การผ่าตัดคลอดส่วนใหญ่เกิดในสตรีตั้งครรภ์ในกลุ่ม 5 (ร้อยละ 28.91) กลุ่ม 1 (ร้อยละ 23.71) และกลุ่ม 2 (ร้อยละ 17.65) ตามลำดับ อัตราการผ่าตัดคลอดในสตรีตั้งครรภ์กลุ่ม 1, 2 และ 4 (ครรภ์หลัง เป็นครรภ์เดี่ยว ท่าศีรษะ ครบกำหนด และไม่เจ็บครรภ์เอง) เท่ากับร้อยละ 37.12, 84.02 และ 58.53 ตามลำดับ จากการวิเคราะห์ข้อมูลเพิ่มเติม พบว่าร้อยละ 68.4 ของสตรีครรภ์แรก และร้อยละ 55 ของสตรีครรภ์หลัง ที่ไม่เจ็บครรภ์เอง (กลุ่ม 2b และ 4b) ได้รับการผ่าตัดคลอดก่อนเจ็บครรภ์โดยไม่มีข้อบ่งชี้ที่เหมาะสมเป็นส่วนใหญ่ นอกจากนี้ยังพบว่า อัตราการผ่าตัดคลอดในสตรีครรภ์แรกและครรภ์หลังที่ได้รับการชักนำการคลอด (กลุ่ม 2a และ 4a) เท่ากับร้อยละ 49.38 และ 7.41 ตามลำดับ และส่วนใหญ่พบว่าได้รับการชักนำการคลอดก่อนอายุครรภ์ 40 สัปดาห์ ซึ่งข้อบ่งชี้ของการชักนำการคลอดส่วนใหญ่ไม่เหมาะสม*

สรุป: *อัตราการผ่าคลอดในโรงพยาบาลศิริราช เท่ากับร้อยละ 48.86 การผ่าตัดคลอดในสตรีตั้งครรภ์กลุ่ม 1 และ 2 คิดเป็นประมาณ 1 ใน 3 ของการผ่าคลอดทั้งหมด ซึ่งควรมีการพัฒนากลยุทธ์เพื่อลดการผ่าตัดคลอดที่ไม่จำเป็นต่อไปในอนาคต ซึ่งจะช่วยการลดอัตราการผ่าตัดคลอดโดยรวมได้*

คำสำคัญ: *การแบ่งแบบรอบสัน, อัตราการผ่าตัดคลอด, การคลอด, การชักนำการคลอด*

Introduction

WHO has recommended that appropriate cesarean section (CS) rate is in between 10-15%[1]. Cesarean sections in medically-indicated patients decrease both maternal and fetal mortality rate. However, the procedures are also associated with various complications which require additional resources consumption such as endometritis, blood components transfusion, ICU admission and risk of uterine rupture in further pregnancy, etc.[2, 3] Therefore, unnecessary operations should be avoided because of potential risks of short-term and long-term adverse outcomes in women and fetuses with no additional benefits[1, 4-6].

Cesarean section rate has increased dramatically worldwide in both developed and developing countries[7]. In 2014, CS rate was 32.2% in the United States[8] while it was 25%, 19.5%, and 7.3% in Europe, Asia, and Africa, respectively. In Asia, CS rate has been growing for more than 15% from only 4.4% percent in 1990[9]. Thailand is one of the countries where CS rate has been rising up particularly for private cases or women delivered in private hospital, similar to what have been reported from other countries[10, 11]. Possible factors influencing the increasing trend include increased in maternal obesity[12-14], elderly gravidarum[15-17], and maternal desires[18-21].

Previously, there were a number of classification systems developing in attempt to identify and analyze the cause of excessive CS[18, 22-24]. However, none has been accepted internationally. Eventually, in 2014, WHO proposed the Robson classification system[1] as a global standard to classify pregnant women into ten systematic groups using basic obstetric information[25]. WHO also recommended the routinely use of Robson classification to analyze, synthesize and develop the strategy on regular basis to downsize unnecessary CS. In addition, the classification system is functional to follow-up, and evaluates the effectiveness of such strategy[1]. To date, the Robson classification is extensively used in many countries worldwide due to its ease of use, repeatable and clinically relevant.

Siriraj Hospital is a large university-based tertiary care hospital with over 7,000 deliveries each year. CS rate has increased to almost 50% in the past years, which is much higher than what has been recommended. It is possible that unnecessary CS could contribute to such increase in CS to some degree. In 2017, Siriraj Hospital has adopted Robson classification to classify pregnant women and evaluates possible causes of unnecessary CS and identify possible intervention to reduce CS rate.

Therefore, the primary aim of this study was to determine the CS rate in Siriraj Hospital according to Robson classification. The secondary objectives were to identify specific group of women with high CS rate, identify possible reasons, and develop strategy to decrease unnecessary CS.

Materials and Methods

After study protocol was approved by Siriraj institutional review board, a cross-sectional study was conducted in 4,998 pregnant women who admitted for delivery in Siriraj Hospital from January to August 2017. Data were extracted from medical records to classify the women into 10 groups according to Robson classification, including parity, gestational age, number of fetuses, fetal lie and presentation, previous CS, and onset of labor. The Robson classification is demonstrated in Table 1. Other characteristics were also recorded, including maternal demographic data, labor induction, route of delivery, and indications for CS.

Data for Robson classification was collected in a specific form by trained nurses after delivery of each woman. These data were entered into a spreadsheet and double checked by research assistant before final analysis.

Continuous variables were reported as mean and S.D., while categorical variables were reported as percentage. The all-case percentage distribution according to Robson classification was determined, together with CS rate, percentage contribution and relative contribution of CS in each group. Women in

group 2 and Group 4 were classified into those with labor induction (2a and 4a) and those with pre-labor CS (2b and 4b) for further detailed analysis. Indications for CS were collected as appeared in medical records. The results were reported and interpreted as stated in WHO's implementation manual[26].

Results

The total number of pregnant women delivered at Siriraj Hospital during the study period was 4,998. Baseline characteristics of pregnant women are shown in Table 2. Mean maternal age was 29.9±6.3 years, and the mean body mass index (BMI) was 22.1±4.4 kg/m^2. In women with cesarean delivery, maternal age and BMI were significantly higher and they were significantly more likely to be overweight and obese. In addition, they were also significantly more likely to be nulliparous.

Characteristics according to Robson classification are shown in Table 3. The majority of pregnant women were nulliparous (50.7%), delivered at > 37 weeks (89.6%), were singleton pregnancy (98.4%), had vertex presentation (95.3%), and had spontaneous labor (74.2%). Previous cesarean delivery was found in 17.9% of cases. Overall CS rate in this study were as high as 48.86%.

Pregnant women were categorized into 10 groups according to Robson classification and total number of CS and percentage distribution of CS in each group were reported as shown in Table 4. The majority of women were in group 1 (31.21%), followed by group 3 (25.21%) and group 5 (14.17%), respectively. The 3 leading group-specific CS rates were observed in group 1, 2, and 4 were 37.12%, 84.02%, 58.53%, respectively. Major contribution of CS were group 5 (28.91%), group 1 (23.71%), and group 2 (17.65%).

The detailed analyses were performed in group 2 and group 4. The results are shown in Table 5 and 6, respectively. Each of the 2 groups was classified into 2 subgroups, i.e., those with labor induction (2a and 4a) and those with pre-labor CS (2b and 4b).

Table 1. Robson classification.

Group	Characteristics
Group 1	Nulliparous with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labor
Group 2	Nulliparous with single cephalic pregnancy, ≥ 37 weeks gestation who either had labor induced (2a) or were delivered by caesarean section before labor (2b)
Group 3	Multiparous without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labor
Group 4	Multiparous without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation who either had labor induced (4a) or were delivered by caesarean section before labor (4b)
Group 5	All multiparous with at least one previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation
Group 6	All nulliparous women with a single breech pregnancy
Group 7	All multiparous women with a single breech pregnancy, including women with previous uterine scars
Group 8	All women with multiple pregnancies, including women with previous uterine scars
Group 9	All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars
Group 10	All women with a single cephalic pregnancy < 37 weeks gestation, including women with previous scars

Table 2. Baseline characteristics of pregnant women.

Characteristics	All women N = 4998	Vaginal delivery N = 2556	Cesarean delivery N = 2442	p value
	Mean ± SD	Mean ± SD	Mean ± SD	
Mean age ± SD (years)	29.9 ± 6.3	28.4 ± 6.2	31.6 ± 5.9	< 0.001
Mean BMI ± SD (kg/m^2)	22.1 ± 4.4	21.6 ± 4.0	22.7 ± 4.7	< 0.001
	N (%)	N (%)	N (%)	
BMI category				< 0.001
Underweight	914 (18.3%)	548 (22.4%)	366 (15.4%)	
Normal	3113 (62.3%)	1516 (62%)	1416 (59.7%)	
Overweight	684 (13.7%)	286 (11.7%)	398 (16.8%)	
Obesity	287 (5.7%)	84 (3.8%)	193 (8.1%)	
Parity				< 0.001
0	2536 (50.7%)	1237 (48.4%)	1299 (53.2%)	
1	1884 (36.9%)	898 (35.1%)	946 (38.7%)	
2	491 (9.8%)	326 (12.8%)	165 (6.8%)	
≥ 3	127 (2.5%)	95 (3.7%)	32 (1.3%)	

Table 3. Characteristics of pregnant women used for Robson classification.

Characteristics	N (%)
Parity	
Nulliparous	2536 (50.7%)
Multiparous	2462 (49.3%)
Gestational age	
≥ 37 weeks	4480 (89.6%)
< 37 weeks	518 (10.4%)
Number of fetuses	
Singleton	4916 (98.4%)
Multiple	82 (1.6%)
Fetal presentation	
Vertex	4761(95.3%)
Breech	221 (4.4%)
Others	16 (0.3%)
Previous cesarean delivery	894 (17.9%)
Onset of labor	
Spontaneous	3709 (74.2%)
Induction of labor or pre-labor cesarean delivery	1289 (25.8%)
Route of delivery	
Vaginal delivery	2556 (51.1%)
Cesarean delivery	2442 (48.9%)

Table 4. Robson classification.

Group	Women in group	CS in group	Group size (%)	CS rate in group (%)	Contribution of CS (%)	Relative contribution of CS (%)
1	1560	579	31.21	37.12	11.58	23.71
2	513	431	10.26	84.02	8.08	17.65
2a	162	80	3.24	49.38	1.06	3.28
2b	351	351	7.02	100.00	7.02	14.37
3	1260	119	25.21	9.44	2.38	4.87
4	120	70	2.40	58.33	1.40	2.86
4a	54	4	1.08	7.41	0.08	0.16
4b	66	66	1.32	100.00	1.32	2.70
5	708	706	14.17	99.72	14.13	28.91
6	133	131	2.66	98.50	2.62	5.36
6	133	131	2.66	98.50	2.62	5.36
7	88	87	1.76	98.86	1.74	3.56
8	82	73	1.64	89.02	1.46	2.99
9	16	16	0.32	100.00	0.32	0.66
10	518	230	10.36	44.40	4.60	9.42
Total	**4998**	**2442**	**100.00**	**48.86**	**48.86**	**100.00**

Table 5. Detailed analysis of pregnant women in group 2.

Group	N (%)	CS
2a (N = 162)		
GA (weeks)		
< 40	114 (70.4%)	54 (47.4%)
40 - 41	48 (29.6%)	26 (54.2%)
Mean birth weight ± SD (g)	2980.1 ± 417.4	
Indication for CS (N = 80)		
Failed induction		41 (51.3%)
Abnormal FHR		39 (48.7%)
2b (N = 351)		
< 40	305 (86.9%)	
40 - 41	46 (13.1%)	
Mean birth weight ± SD (g)	3173.2 ± 404.3	
Indication for CS		
Placenta previa		14 (4%)
CPD		69 (19.7%)
AMA		44 (12.5%)
Unfavorable cervix		25 (7.1%)
Elective		89 (25.4%)
Others / not specified		110 (31.3%)

FHR = fetal heart rate, CPD = cephalo-pelvic disproportion, AMA = advanced maternal age

Table 6. Detailed analysis of pregnant women in group 4.

Group	N (%)	CS
4a (N=54)		
GA (weeks)		
< 40	40 (74.1%)	2 (5%)
40-41	14 (25.9%)	2 (14.3%)
Mean birth weight ± SD (g)	3232.4 ± 505.2	
Indication for CS (N=4)		
Failed induction		1 (25%)
Abnormal FHR		3 (75%)
4b (N=66)		
< 40	59 (89.4%)	
40-41	7 (10.6%)	
Mean birth weight ± SD (g)	3190 ± 428.1	
Indication for CS		
Placenta previa		4 (6.1%)
CPD		10 (15.2%)
AMA		11 (16.7%)
Unfavorable cervix		4 (6.1%)
Elective		4 (6.1%)
Others / not specified		33 (50%)

FHR = fetal heart rate, CPD = cephalo-pelvic disproportion, AMA = advanced maternal age

In women with labor induction, CS rates were 49.38% and 7.41% of nulliparous and multiparous women (subgroup 2a and 4a, respectively). Labor induction was offered at before 40 weeks in 70.4% and 74.1% of women in subgroup 2a and 4a, respectively. Failed induction was reported as indication for CS in 51.3% and 25% of CS in subgroup 2a and 4a, respectively.

Women who had pre-labor CS contributed mainly in both group 2 and 4, i.e., 68.4% in nulliparous (subgroup 2b) and 55% in multiparous women (subgroup 4b). Most common recorded indications for subgroup 2b were elective (25.4%), cephalo-pelvic disproportion (19.7%), and advanced maternal age (12.5%). Most common recorded indications for subgroup 4b were advanced maternal age (16.7%), cephalo-pelvic disproportion (15.2%), and elective and unfavorable cervix (6.1% each). Other unspecified indications were found in 31.3% of subgroup 2b and 50% of subgroup 4b. Placenta previa was reported as indication for CS in 4% and 6.1% of subgroup 2b and 4b, respectively.

Discussion

Of 4,998 women, 2,442 women were delivered by CS, corresponding to 48.86% CS rate, which is much higher than what WHO has recommended at 10-15%[1]. The major contributions to this high rate were from groups 1, 2, and 5 (23.71%, 17.65%, and 28.91%, respectively). This was similar to other previous reports in Thailand and other countries worldwide[4, 6, 7, 27].

The results showed that majority of women delivering at Siriraj Hospital were nulliparous, i.e. 41.48% for group 1 and 2, and 27.61% for group 3 and 4. The ratio of the sizes of group 1:2 is 3.0, which is within the expected ratio of > 2:1 and the ratio of group 3:4 is 10.5 which is also as expected (higher than ratio

of group1/2). This indicated that not too many labor inductions or pre-labor CS were performed in nulliparous women and multiparous women without previous CS[26]. The size of group 5 (previous CS) was relatively high (14.17%) reflecting that there was high CS rate in the past. The high contribution of group 5 also associated with high overall CS rate that this group contributed the most of CS (28.91% of all CS). The findings were in agreement with previous studies[10, 27-29] and multi-country surveys by WHO[7]. If the CS rate in this group needs to be reduced, trial of labor after cesarean (TOLAC) should be considered, particularly for women with one previous transverse low-segment scar. However, TOLAC is currently not recommended in our institution. However, decreasing the rate of primary CS could help reducing the number of women in this group in the future.

CS rates in group 1 and 3 were quite high (37.12%, and 9.44%, respectively) as compared with WHO recommendation[7, 26]. This raised the concern regarding the appropriateness of indications for CS among these groups of women. The most common indications for CS in both groups were cephalo-pelvic disproportion and abnormal fetal heart rate pattern. There are still variations among obstetricians in the decision of CS from these indications, including criteria of diagnosis, management guidelines, and decisions for CS. In addition, concerns about possible medical lawsuits could also play an important role in decision-making process among these cases. Development and implementation of appropriate management and decision guideline or setting up a second-opinion system for CS could help reducing the CS rate in these groups of women in the future.

For labor inductions (subgroup 2a and 4a), the results showed that CS rate was still high, especially among nulliparous women (subgroup 2a) which was 49.38%. The success rate of labor induction was still unsatisfactory and much less than what has previously reported[30]. Further analysis showed that labor inductions were offered before 40 weeks in 70.4% and 74.1% of nulliparous and multiparous women (subgroup 2a and 4a). Although definite indications were not being able to identified, these inductions might not be appropriate in every case. Again, this also could be the results of the lack of a uniform guideline and management scheme. A guideline for labor induction should be developed and strictly implemented, starting from indications, appropriate timing, technics of induction, and decision for CS. If majority of these women were allowed to have spontaneous labor later, the rate of CS could be reduced from lower risk of CS as in group 1 and 3.

Pre-labor CS was identified as another important problem of excessive CS rate, especially in nulliparous women (subgroup 2b), which contributed to 68.4% of group 2 and 14.37% of overall CS. As documented in medical records, majority of indications were not absolute indications and might not be justified, including elective CS, cephalo-pelvic disproportion, advanced maternal age, and unfavorable cervix. This could be from many reasons. Many women are scared about labor pain and decide to have a pre-labor CS without appropriate counseling. It also could be the matter of better time management that pre-labor CS is more convenient for both women and obstetricians. Additionally, it is possible that some obstetricians chose to recommend pre-labor CS to avoid unexpected complications during labor and delivery, which could lead to medical lawsuit. However, these possible reasons could not be evaluated in this study.

Although these problems are relatively hard to solve due to individual variations in attitudes and perceptions, at least the results have shown the importance of pre-labor CS in Thai population. It is possible that many women and some obstetricians are unaware of the immediate and long-term adverse consequences of CS and still prefer CS than vaginal delivery. Therefore, improving health literacy to adequate level regarding this issue for both the women and obstetricians could help in reducing the rate of CS by reducing pre-labor CS. If these women were to be waited for spontaneous labor or had labor inductions with appropriate indications, overall CS rate would be reduced to some degree.

The sizes of group 6 and 7 (term, breech presentation) were 4.42%, which is slightly higher that what is expected in general population of 3-4%. The

CS rate of both groups were almost 100% due to the acceptance of breech presentation as an indication for CS and external cephalic version is not recommended in our institution. The size of group 10 (preterm) was relatively high at 10.36% with CS rate of 44.4%. This can be explained by that Siriraj Hospital is a tertiary referral hospital for high-risk and complicated pregnancies that these women are commonly complicated by preterm deliveries. In addition, these complicated cases were commonly indicated for CS partly due to coexisting complications.

The CS rate in group 8 (multifetal pregnancy) was also higher (89.02%) than average level as stated by WHO[26]. In multi-country survey by WHO, the CS rate in group 8 was 57.7%[7], and it ranged from 61.8-98.5% in other studies[10, 27-29]. However, CS rate in this group depends on types of multifetal pregnancy, parity status and previous uterine scar.

The strength of this study was that inclusion of large samples in a tertiary care hospital. Data collection was planned, and recorded by trained personnel before the women were discharged from the hospital. The study also demonstrated the ease and feasibility of implementing Robson classification. However, there were also some limitations in this study. First, this study was conducted in a short period of time (8 months) that the trend of CS rate cannot be evaluated. There might be some incorrect data, especially data on onset of labor, which could lead to possible misclassification of women into groups (group 1-4). However, these data were collected by on-duty nurses that such misclassifications should be minimal and would not have significant changes in the results. The absence of some details in medical records, especially indications for CS, precludes the exact evaluation of appropriateness of CS indications. Finally, the data of maternal and fetal outcomes were not collected to evaluate its correlation within each group. Future, larger studies might be needed to determine such correlation and evaluate if any future changes could reduce CS rate and whether it affect pregnancy outcomes. In addition, the study was conducted in a university-based tertiary care hospital that incidence of complicated cases could be unusually higher than other settings. But this probably might not be the reasons for such high CS rate in this setting.

Conclusion

In conclusion, the CS rate in Siriraj Hospital was high at 48.86%. The major contributions were in group 1, 2, and 5 of Robson classification. Major contributing factors could be the inappropriate indications for CS, especially in nulliparous women both in group 1 and 2. Indications for CS in women with spontaneous labor (group 1 and 3) need to be validated for appropriateness. Many indications for CS in those with pre-labor CS (group 2a and 4a) were unjustified. Labor inductions resulted in unsatisfactory success rate. Interventions to reduce the incidence of CS specifically among women in these groups would help to reduce the overall CS rate. Regular follow-up of CS rate and audit of compliance to standard guideline, especially in terms of induction of labor and indications for CS should be conducted in order to maintain standards of care in obstetric patients. The use of Robson classification should be continued to evaluate trend in CS rate, for internal and external audit of CS, and evaluate the success of future interventions.

Potential conflicts of interest

The authors declare no conflict of interest.

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